TCS PDR
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(TCS C4I)
Block 0

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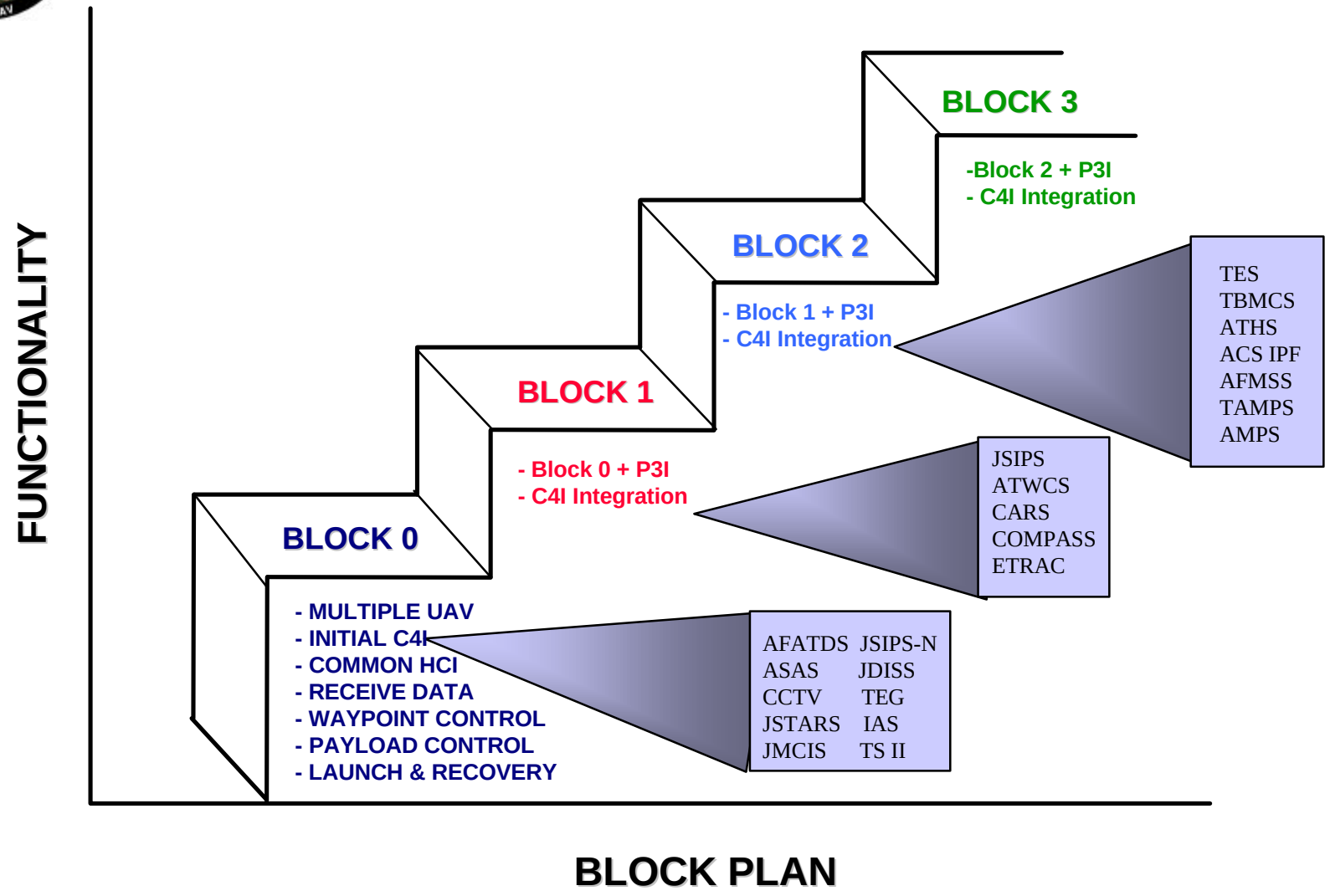
TCS Plan


FUNCTIONALITY
BLOCK 3
-Block 2 + P3I
- C4I Integration
BLOCK 2
- Block 1 + P3I
- C4I Integration
BLOCK 1
- Block 0 + P3I
- C4I Integration
BLOCK 0
- MULTIPLE UAV
- INITIAL C4I
- COMMON HCI
- RECEIVE DATA
- WAYPOINT CONTROL
- PAYLOAD CONTROL
- LAUNCH & RECOVERY
TES
TBMCS
ATHS
ACS IPF
AFMSS
TAMPS
AMPS
JSIPS
ATWCS
CARS
COMPASS
ETRAC
AFATDS JSIPS-N
ASAS JDISS
CCTV TEG
JSTARS IAS
JMCIS TS II
BLOCK PLAN

IDD Development Process

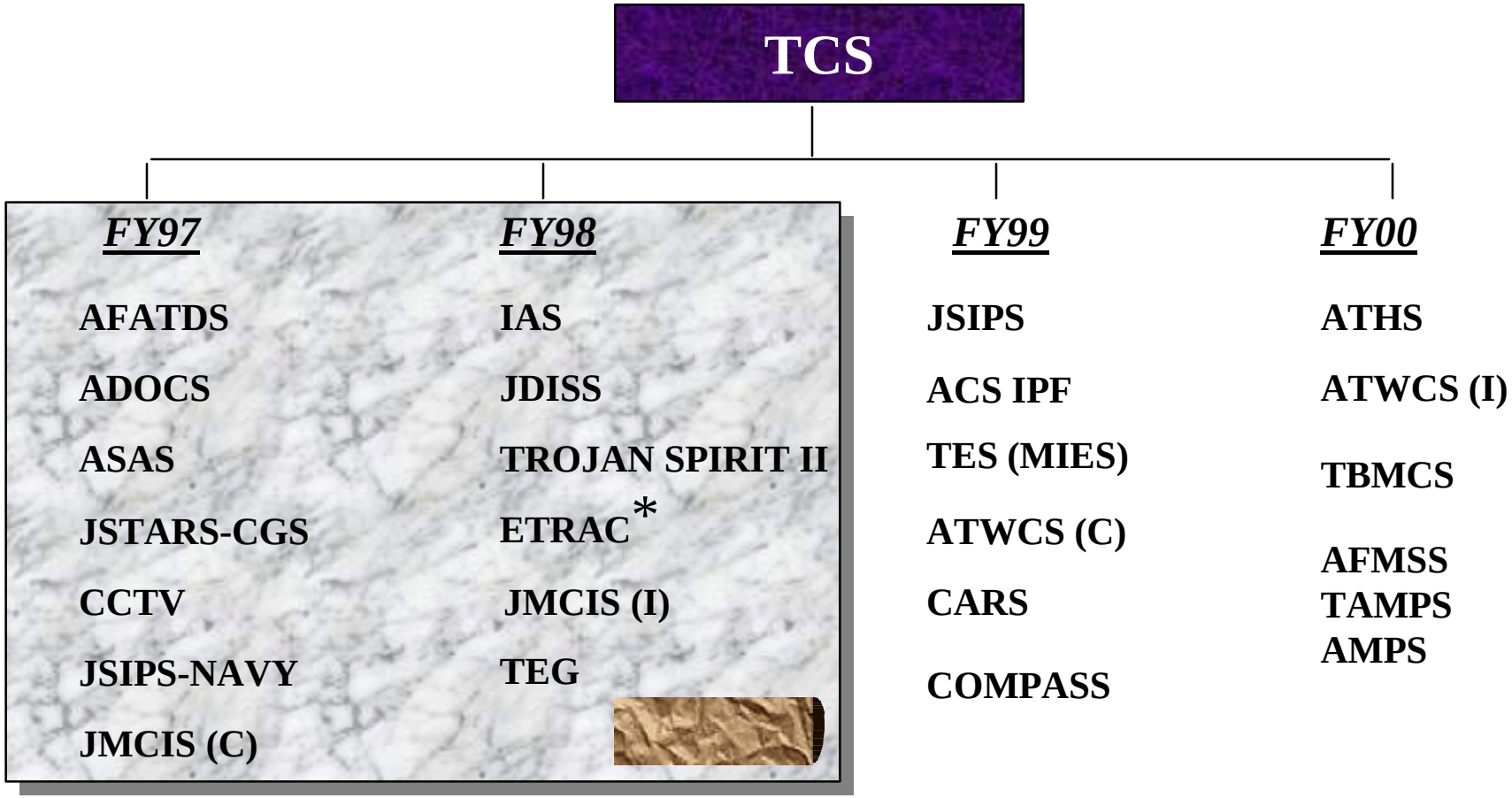
- DO NOT Impose Requirements on C4I System Programs
- I/F Requirements Reflect Current/Near-Term C4I Systems Capabilities
- I/F Requirements Originate From:
  - C4I Program Offices (GOV'T & Contractor)
  - Service C4I Requirement Offices & Users
  - Lessons Learned from Exercises, Demos, and User Involvement

TCS C4I Interface Requirements (Block 0)

- C4I Systems Listed in the ORD
- Connectivity to the C4I Systems
  - Interface Requirements Implementation
    - Hardware Design
      - Physical
    - Software Design
      - Protocol
      - Product

TCS C4I Systems IDD Development Plan

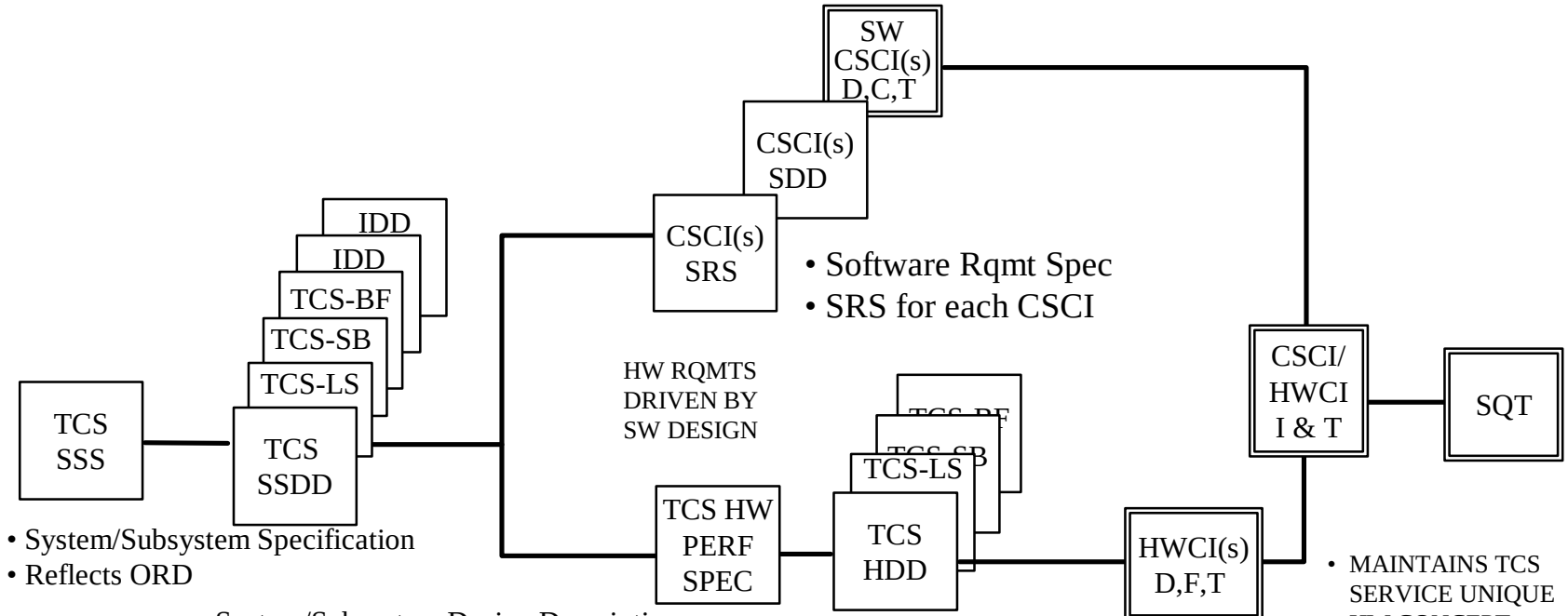
(Initial Baseline)



* Interface Implemented in Block 1

C - Connectivity
I - Integration

TCS Documentation Flow



Why a TCS C4I JII

- Joint Interoperability Interface
  - Captures the I/F at the Highest Level
    - Inputs & Outputs
  - Describes the Purpose/Intent of the I/F
  - Delineates Outputs to End-Users
- Used by C4I POs for TCS Capabilities, and High-Level I/F Architecture(s)
  - TCS 233 (C4I JII #2)
    - "Executive" Summary of the TCS C4I IDDs

IDD - What is a TCS C4I IDD?

- Captures Mil-Std-498 DIDs
  - IRS (Interface Requirements Specification)
  - IDD (Interface Design Description)
- Captures OSI 7 Layer Model for Protocols
- Captures all I/F Reqs of the Current C4I System (by Version) as they Relate to UAV Data from the TCS for TCS Blocks 0, 1, ...
- Used to Implement HW & SW Design, and Assist with System I/F Testing at All Levels.

Contents of a TCS C4I IDD
(OSI 7 Layer Model)
Protocols

Application Layer	How real work gets done, i.e. file system operations
Presentation Layer	Data Syntax, i.e. floating-point formats
Session Layer	How data sequences larger than a packet are transferred and reconstructed
Transport Layer	Quality and nature of data delivery, i.e. how retransmissions are handled
Network Layer	Addressing and routing structure
Datalink Layer	Logical organization of data bits, i.e. framing, physical addressing, and checksumming
Physical layer	Physical properties of media and electrical characteristics of the signals

TCS C4I IDD Structure

- Section 1
  - Scope: Provides identification of the systems (TCS & C4I), interfacing entities, and interfaces which are addressed in the IDD, and gives a brief overview of these systems.
- Section 2
  - Referenced Documents: Lists all referenced documents applicable to this development effort.
- Section 3
  - Interface Design: Identifies and describes the characteristics of the interface(s) defined in the IDD, and specifies the requirement(s) placed on the TCS by the interface.
  - Section 4
  - Requirements Traceability and Qualification Provisions: Defines the requirements traceability to the TCS SSDD, and also defines the qualification methods which are used to ensure that each requirement of the interface has been met.
  - Section 5
  - Notes: Provides background information regarding the specific C4I system addressed; and a list of acronyms and abbreviations used in the IDD.
  - Appendices
  - As applicable to provide referenced data.

TCS C4I IDD
(Section 3)

- "Heart" of the IDD
- Section of the IDD that Addresses the OSI Layers for Protocols
  - Description of Interface Characteristics
    - Msg Types, Range, Precision, Security, Timing, Freq. Etc.
  - Specific Requirements (HW & SW) Which Implement the TCS HW & SW Design
    - Requirements are denoted by "SHALL"
    - Requirements are Numbered for Traceability
    - Requirements Trace to the TCS SSDD

Section 3 Interface Requirements

- Interface Requirements Include:
  - Physical, Protocol, & Product
- Allocated to Engineering Builds & Blocks via the CM Process
  - “Engineering Build Reviews”
    - Input & Recommendations for C4I Reqs Begin with Input from the C4I IPT Team
    - All IPTs Review Requirements for Approval
    - Approved Requirements then Implemented in HW & SW Design

Physical Interface(s)

- IEEE 802.3 Ethernet Local Area Network (LAN)
- RG-59/U Coaxial Copper Cable
- 50/125 Micron Multi-Mode Fiber Pair
- Multi-Subscriber Equipment (MSE)
- Tactical Communications Interface Module (TCIM)

Meets JTA
& CIGSS STDs

Protocols

- Transmission Control Protocol (TCP) Internet Protocol (IP)
  - MIL-STD-1777, MIL-STD-1778
- Simple Mail Transfer Protocol (SMTP)
  - JTA (RFC-821)
- File Transfer Protocol (FTP)
  - MIL-STD-1780
- Network File Server (NFS)
  - JTA (RFC-1094)
- X.25
  - Federal STD 1041

Meets JTA & CIGSS STDs

Products

- Digital Still Frames (NITF 2.0)
  - Header Data
  - TM Data (text field)
  - Symbols/Labels
    - MIL-STD-2500B
- NTSC Video (Analog)
    - EIA RS-170A (SMPTE 170M)
  - Annotated
  - Encoded
    - NIMA

Meets JTA
& CIGSS STDs

NITF 2.0 Example(s)
(Mil-STD-2500B)

NITF File Header	Images	Symbols	Labels	Text	Support Data Extension	Reserved Segments

TCS EO/IR

- **Generated with DII Imagery Services**
- **Support Data in Header Field & Text Field**
- **Removable Overlays**

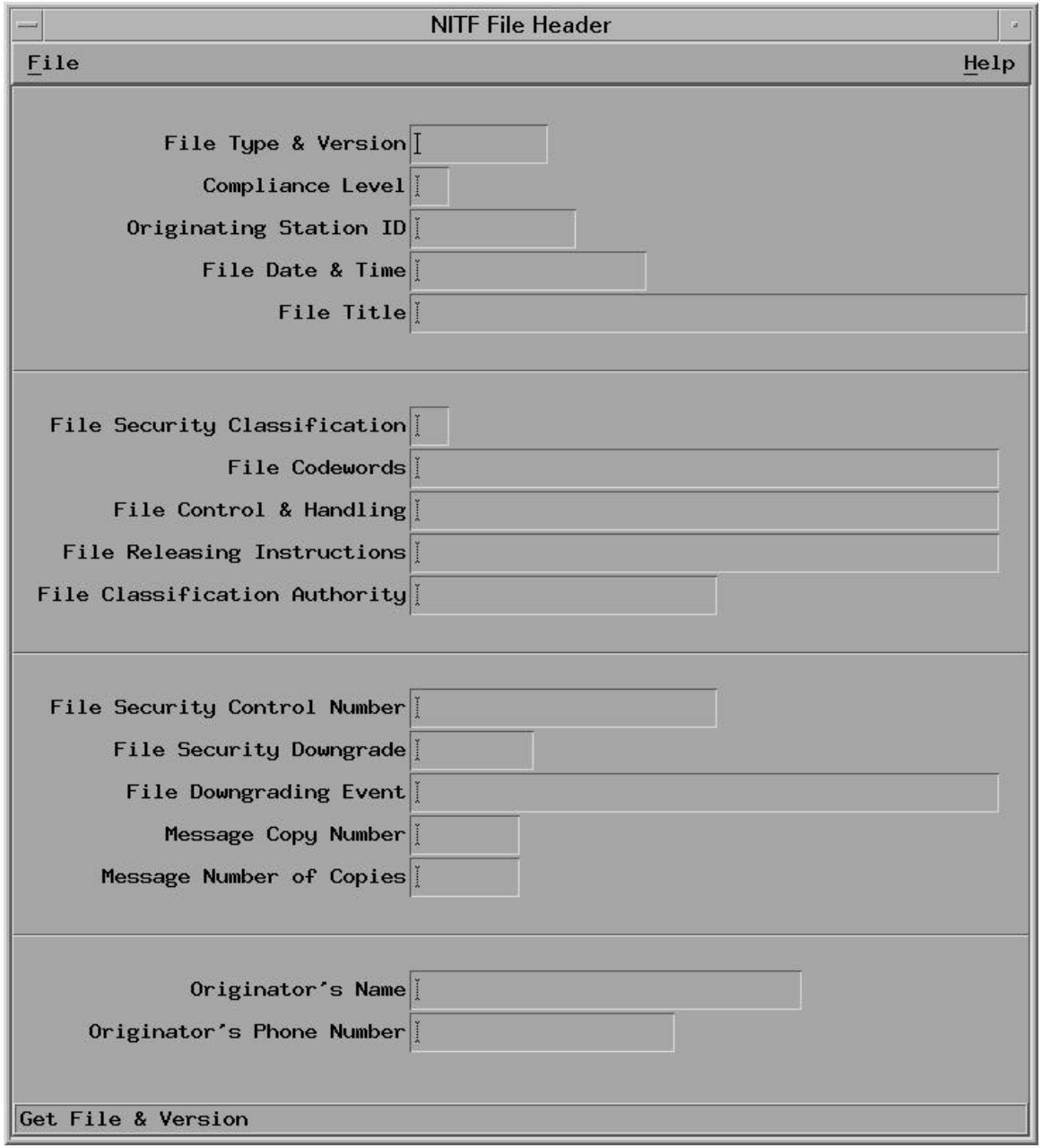
TCS MAE SAR

- **Generated in TESAR Processor**
- **Support Data in Header**

HAE(EO,IR,SAR)

- **Generated in the HAE CGS**
- **Support Data in Header**
- **SDEs incorporated**

Meets JTA & CIGSS STDs


NITF File Header
File
Help
File Type & Version
Compliance Level
Originating Station ID
File Date & Time
File Title
File Security Classification
File Codewords
File Control & Handling
File Releasing Instructions
File Classification Authority
File Security Control Number
File Security Downgrade
File Downgrading Event
Message Copy Number
Message Number of Copies
Originator's Name
Originator's Phone Number
Get File & Version

Products - Continued

- Tactical Messages
  - Common Message Processor (CMP) (DII COE)
    - Army Comms Segment (Messages)
      - USMTF, ACCS, OTH-GOLD, IEW COMCAT, etc.
    - Army Comms Server (Protocols)
      - TCP/IP, FTP, X.25, etc.
- Data Server Objects
  - Flight Route Data & Mission Data
- Voice

Meets JTA
& CIGSS STDs

Section 3 (Examples) from JSTARS AI CGS IDD

Document # TCS 209

1. Sections 3.2.3.2 & 3.2.3.3
2. NTSC Encoded ESD Data
3. Data Server Object Data (Mission List Data)

TCS C4I IDD (Section 4)

- Titled "Requirements Traceability and Qualification Provisions"
  - Requirements are in Table Format (Req #, Text, Paragraph #, Block, SSDD Req & Test Qualification)
  - IRS Component that Addresses Qualification Methods
  - IDD Component that Addresses Traceability
- Section 4 Used to Test the Interface Between TCS and the C4I System

Section 4 (Example) from JSTARS AI CGS IDD

Document # TCS 209

1. Table 4.0-1
   Requirements Traceability & Qualification Methods Table

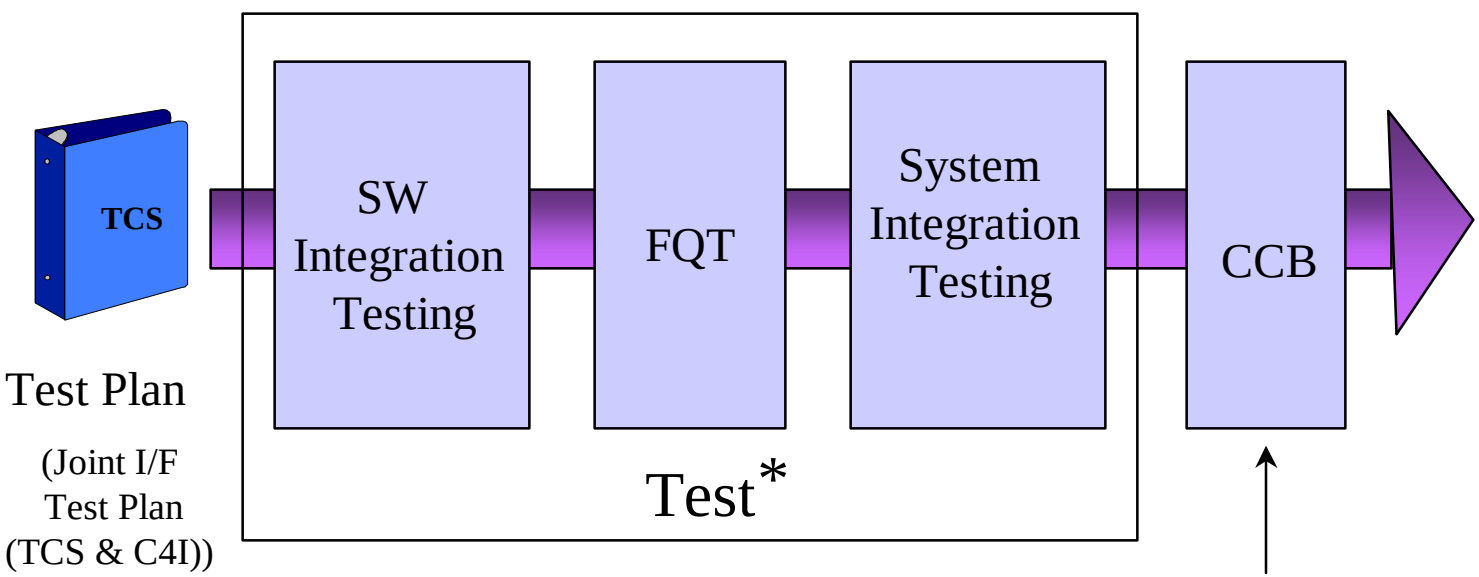
TCS Block 0 C4I Systems

- TCS C4I Interface Design (HW & SW) Provides Connectivity to:
  - AFATDS
  - ASAS RWS
  - JSTARS AI CGS
  - JSIPS-N
  - JDISS
  - JMCIS
  - CCTV
  - TEG
  - IAS
  - TS II

C4I IDD(s) - Testing

- C4I IDD Interface Requirements Used to Perform:
  - Certification Process for Interfaces per C4I IDD
    - Lab-Based TCS Product Testing (early)
    - Software Integration Testing
      - Procedure Check-out (PCO)
    - Formal Qualification Testing (FQT)
    - System End-to-End Integration Testing
    - Exercises & Demonstrations in the Field

Interface Certification Process



C4I Program Offices

- ASAS
- AFATDS
- CCTV
- JMCIS
- JSTARS
- IAS
- TEG
- TS II
- JSIPS-N
- JDISS

Certification & Approval for Operational Reqs

* CM Process Throughout